Free Seminar on Climate Change: What About Tomorrow?

Photos: dry reservoir, drought-damaged corn in USA, 2012

Climate change and global warming will have an increasingly negative impact on food, water, health, extreme weather, and peace. We can use sensible risk management to mitigate and adapt to climate change, which the US Defense Department considers a national security risk.

Hear a panel of experts discuss the issues:

- **Climate Science:** Dr. Thomas L. Delworth, Research Scientist and Group Leader, NOAA/GFDL; Lecturer Princeton U. Published over 90 scientific papers.
- **Solar Energy and Mitigating Climate Change:** Arun Chaddha, Solar Mite Solutions; reducing energy bills and carbon footprint.
- **The Citizens Climate Lobby:** Joe Robertson, Villanova U. The CCL advocates a revenue-neutral carbon fee used to pay dividends to the public.
- **Moderator:** Dr. Jan Dash, former member Middletown Green Team, editor of the UU-UNO Climate Portal.

WHEN: Thursday, September 20, 2012
7:00 – 8:45 p.m.

WHERE: Middletown Public Library
Main Branch, 55 New Monmouth Road, Middletown, NJ

An educated citizenry is a vital requisite for our survival as a free people.

This is a Public Service Event hosted by the Environment Committee of the Democratic Executive Committee, Middletown. For more information please visit www.MiddletownDemocrat.org. Printed in-house: Labor donated.

Bios for Climate Seminar 20Sept2012, Environment Committee

Thomas L. Delworth is a Research Scientist and Group Leader in the Climate Change, Variability and Prediction Group at NOAA's Geophysical Fluid Dynamics Laboratory (GFDL). He is also a Lecturer at Princeton University in the Atmospheric and Oceanic Sciences Program. Dr. Delworth has played a key role in the development of several generations of climate models at GFDL. His research largely focuses on decadal to centennial climate variability and change through the synthesis of climate models and observational data. On these time scales the behavior of the climate system is a mixture of natural variability and the response of the climate system to changing radiative forcing induced by changing greenhouse gases and aerosols. Understanding the natural variability of the climate system on decadal scales is critical to our ability to detect climate change, and to understand the processes responsible for observed change from the global to the regional scale. Dr. Delworth has served on a number of national and international committees, and is an author of more than 90 scientific papers.

Arun Chaddha: I graduated in 1995 from Western New England College with a BSBA in Engineering Management. In 2009, Shannon Martiak and I started Solar Mite Solutions with the goal of helping both residential and commercial clients lower their carbon footprint while reducing their electrical energy costs. Additionally, we have incorporated Energy Audits, Energy Management Systems and Lighting Solutions to help reduce the additional consumption of electrical and carbon fuel that is incurred by the structure, thus further reducing the overall effect on the environment.

Joseph Robertson is a visiting instructor in Spanish language and humanities at Villanova University, where he is also the creator and coordinator of GreenNOVA.org online community for environmentally sustainable projects, and organizer of the ClimateTalks.info roundtable discussion series. He is founder and director of the Hot Spring Network, a social-networking innovation project aimed at brainstorming paradigm-shift solutions, ProjectQuipu.net, a user-made global economic forum that seeks to find new ways to assess the real economic value of intangibles, and to propose generative policy solutions that empower individuals and communities. Through his volunteer work with the non-partisan, non-profit organization Citizens Climate Lobby, he advocates for sustainable energy and climate policy on Capitol Hill. In September 2010, he produced the report *Building a Green Economy: The Economics of Carbon-pricing and the Transition to Clean, Renewable Fuels* for Citizens Climate Lobby. The report is available in print and online and is distributed to elected officials and to organizations across the United States. All of his projects can be accessed through the website - PoetEconomist.com.

Jan Dash has a PhD in theoretical physics from UC Berkeley, and has published over 50 papers in scientific journals. He was Directeur de Recherche at the Centre de Physique Théorique CNRS in Marseille, France. He is currently Visiting Research Scholar at Fordham University and Adjunct Professor at the Courant Institute NYU. Jan is the UU-UNO Climate Initiative Chair and Managing Editor of their Climate Portal at http://climate.uu-uno.org/. He is a Matchmaker for the Climate Science Rapid Response Team whose goal is to provide authoritative scientific answers to media questions. Jan is the author of the popular "one-liner" responses to climate contrarian/denier/faux-skeptic fallacies. He was the Editor of the Climate Statement *Summary and Recommendations to Governments* of the UN Committee on Sustainable Development (*Co*-NGO, NY), delivered to leaders at the Copenhagen, Cancun, and Durban Climate Conferences. Relevant to the economic impacts of global warming, Jan has worked for 25 years in quantitative risk management at various financial institutions, and wrote a book on the subject.

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CLIMATE CHANGE
Introduction

SEMINAR SEPT 20, 2012

MIDDLETOWN, NJ

Jan W. Dash, PhD

GLOBAL WARMING AND CLIMATE CHANGE

- What is Global Warming / Climate Change?
- Is Global Warming due to Human activity?
- Is Global Warming bad?
- What action to mitigate global warming?
  - What about adapting to global warming?

ISSUES - LARGE PICTURE

COSTS – HOW MUCH? FOR WHAT?

ETHICS – WHO GETS HURT?

SURVIVAL – HOW WILL WE BE IMPACTED?

RISK MANAGEMENT

UP-FRONT COSTS (Direct $)

BACK-END COSTS (Climate Impacts, other $)

Global Warming trend of climate change exists, due to humans

- Weather: “It’s cold in Chicago in winter”
- Climate: Average temperature over the globe
- Climate: Look at temperature trends in time
- Result: GLOBAL WARMING: Since 1975, the temperature averaged over the earth has been trending upward (all labs agree).

  WHY? Humans: Greenhouse gases up

American Meteorological Society (2012)

- Avoiding this future warming will require a large and rapid reduction in global greenhouse gas emissions.
- The ongoing warming will increase risks and stresses to human societies, economies, ecosystems, and wildlife through the 21st century and beyond, making it imperative that society respond to a changing climate.

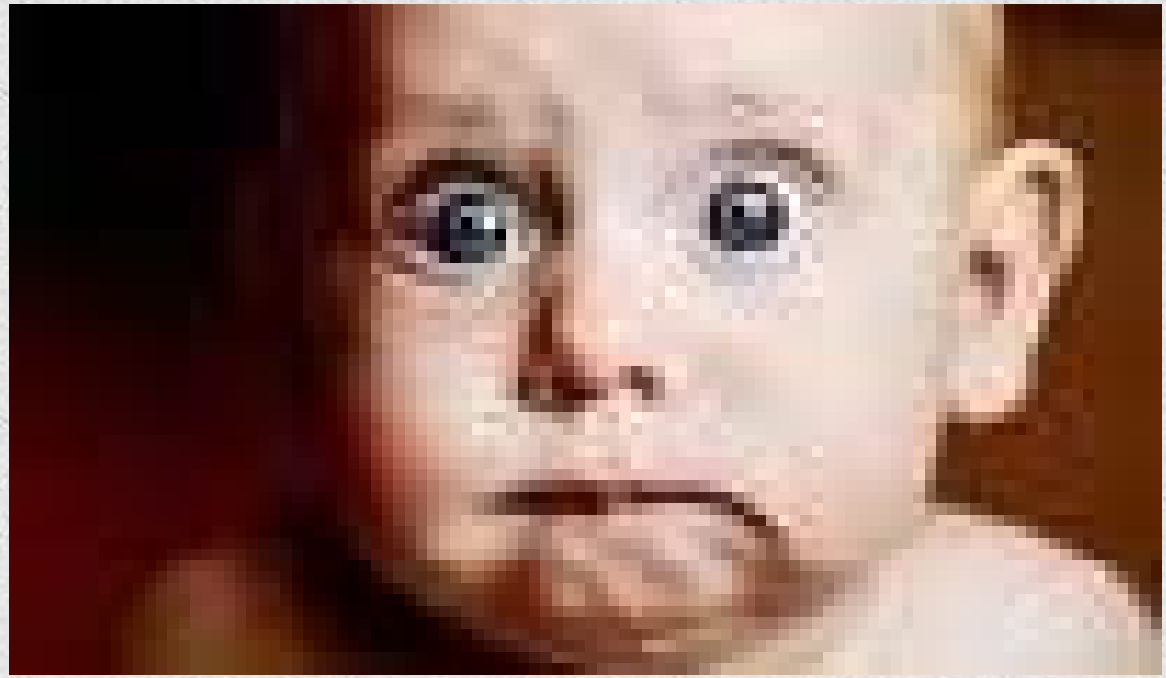
CLIMATE IMPACTS

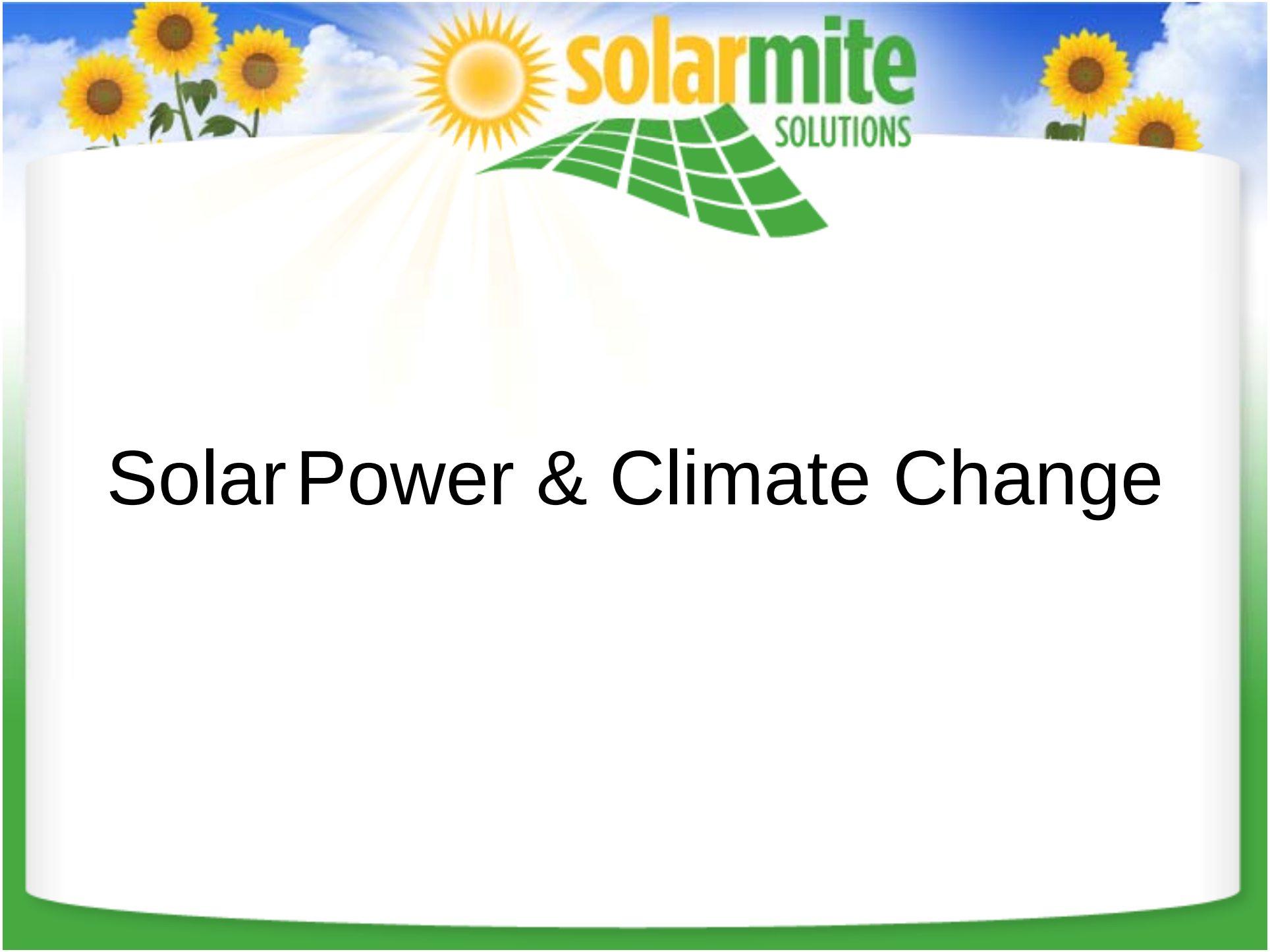
- Climate amplifies naturally produced disasters
- Impacts are being observed right now
- Faint rumbling of impacts on our descendants
  - If Business as Usual behavior continues
- **U.S. Quadrennial Defense Review (2010)**
  - Climate change = U.S. National Security Risk
- Technical reports on impacts appear every week
  - **INCREASED**: Food, Water shortages, War,
  - Disease, Species Extinction, Extreme Weather;
  - Instability of financial, economic systems
- Why bad? Perturb earth like dropping your watch

We CAN act to avoid bad impacts of climate change

- Transition from fossil fuels to renewable energy over time
  - Solar, wind, fusion, advanced fission …
- Save energy, more efficiency
- Local city action – Middletown?
- Support climate legislation
  - Non-partisan Citizen's Climate Lobby revenue neutral carbon fee & dividend

WE NEED TO PROTECT





Solar Power & Climate Change

Photovoltaic Systems

Defined:
of, relating to, or utilizing the generation of a voltage when radiant energy falls on the boundary between dissimilar substances (as two different semiconductors)

Simply Stated

Photo = Light
Voltaic = Electricity

Seminar Objectives

How Solar works and Different Types of Solar

Global Solar Industry

US/NJ Solar Industry

Environmental Benefits

Economics Behind the Investment

History of Solar Power

- French Physicist Edmond Becquerel is credited with discovering the photovoltaic effect in 1839
- British engineer Willoughby Smith discovered the use of Selenium in PV cells can produce energy in 1873
- Calvin Fuller and Gordon Pearson discovered the use of Silicon (a much cheaper and abundant material) And created the first practical Solar Cell in1954 at Bell Laboratories in Holmdel, NJ.
- The Space race in the 1950s and 1960s spurred the development of this technology
- During the oil shortages in the 1970s Earth Based PV Systems started to grow

Definitions - Units of Power

Watt (W) - An International System unit of power equal to one joule per second

Kilowatt (KW) - 1000 Watts

Megawatt (MW) - One million watts (1000 Kilowatts)

Gigawatt (GW) - One Billion Watts (1000 Megawatts)

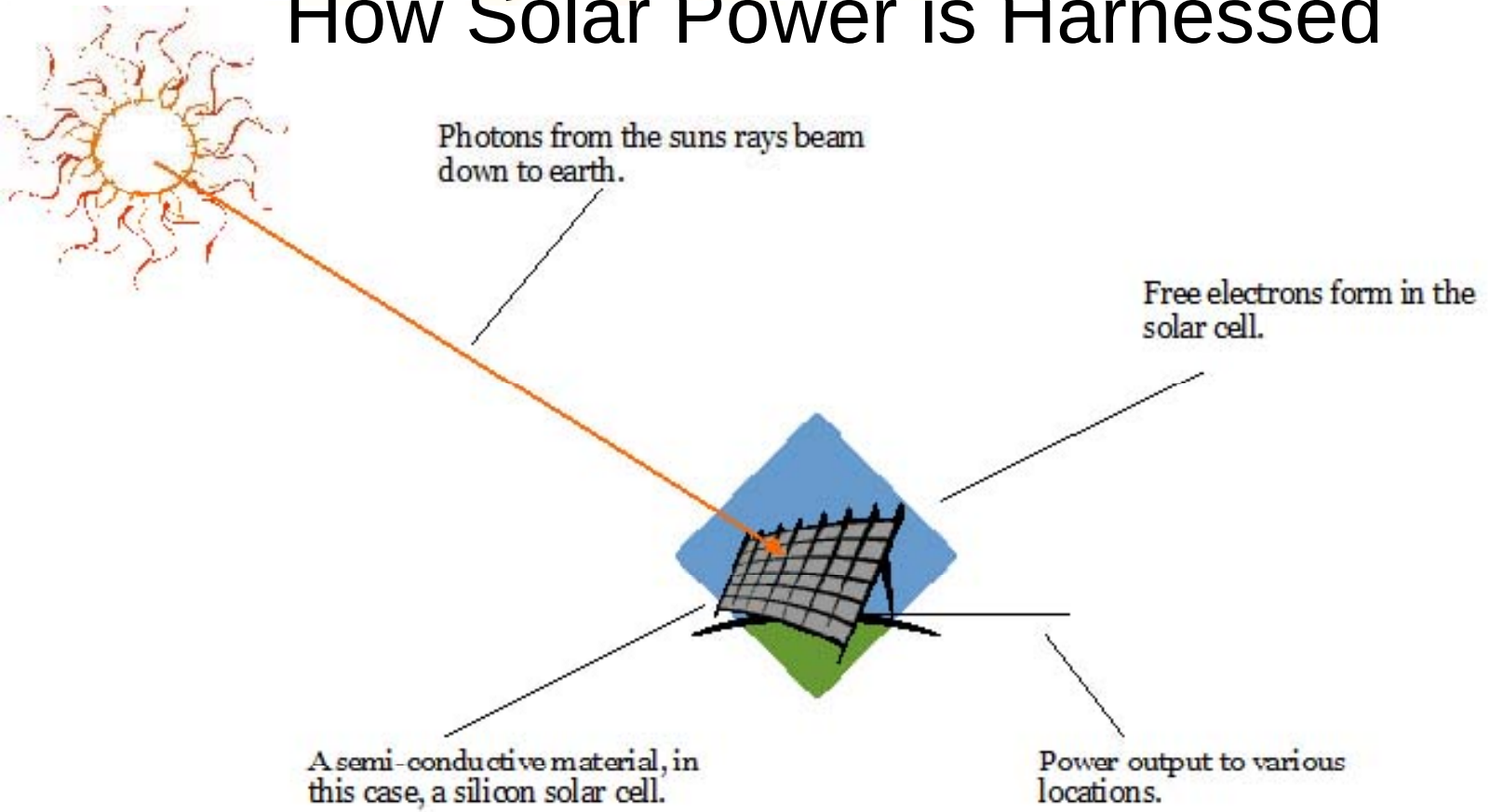
Terrawatt (TW) – One Trillion Watts (1000 Gigawatts)

The World Consumed 20 TWh in 2010

US Energy Info Association

solarmite SOLUTIONS

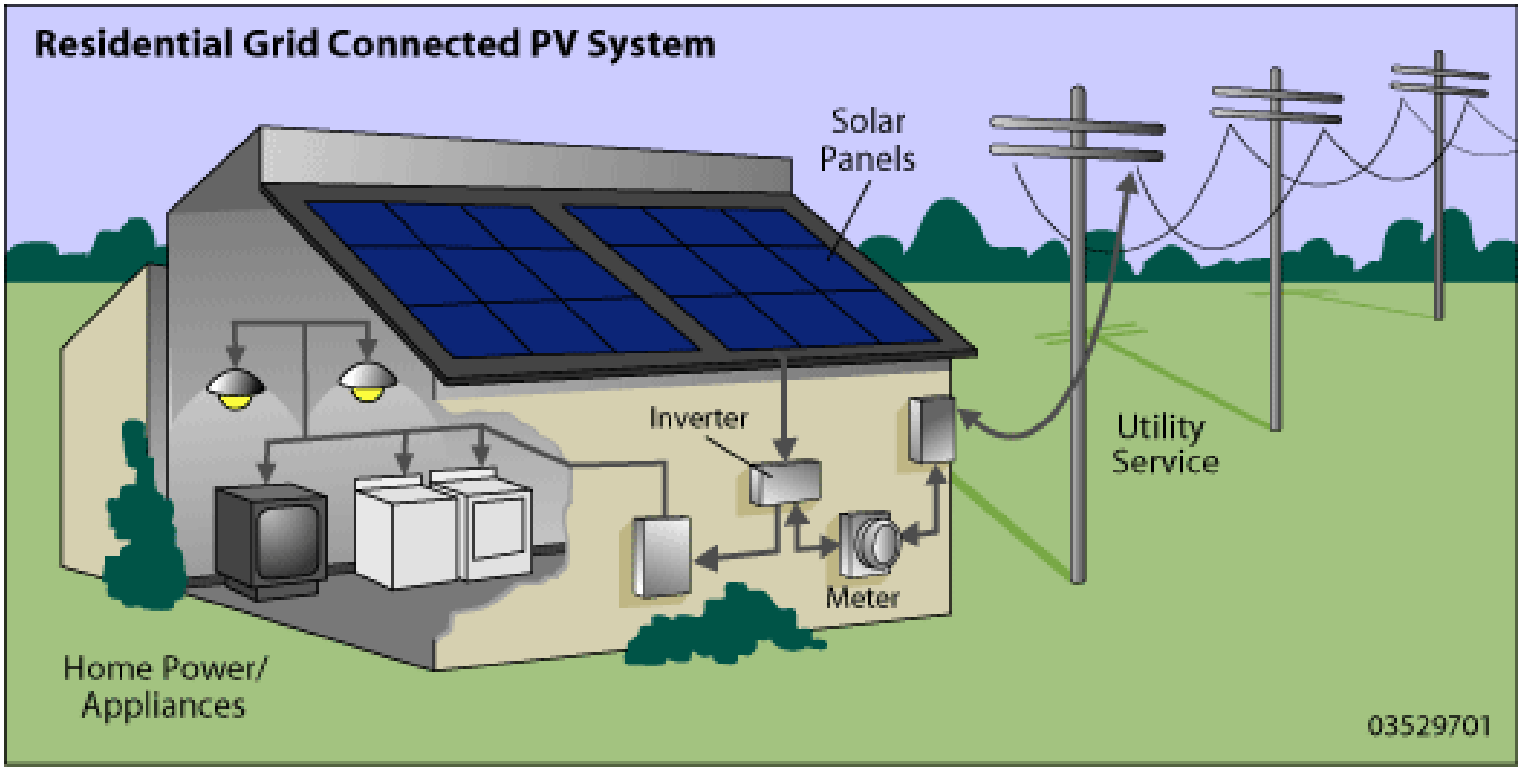
How Solar Power is Harnessed



4 Solar Installation Types

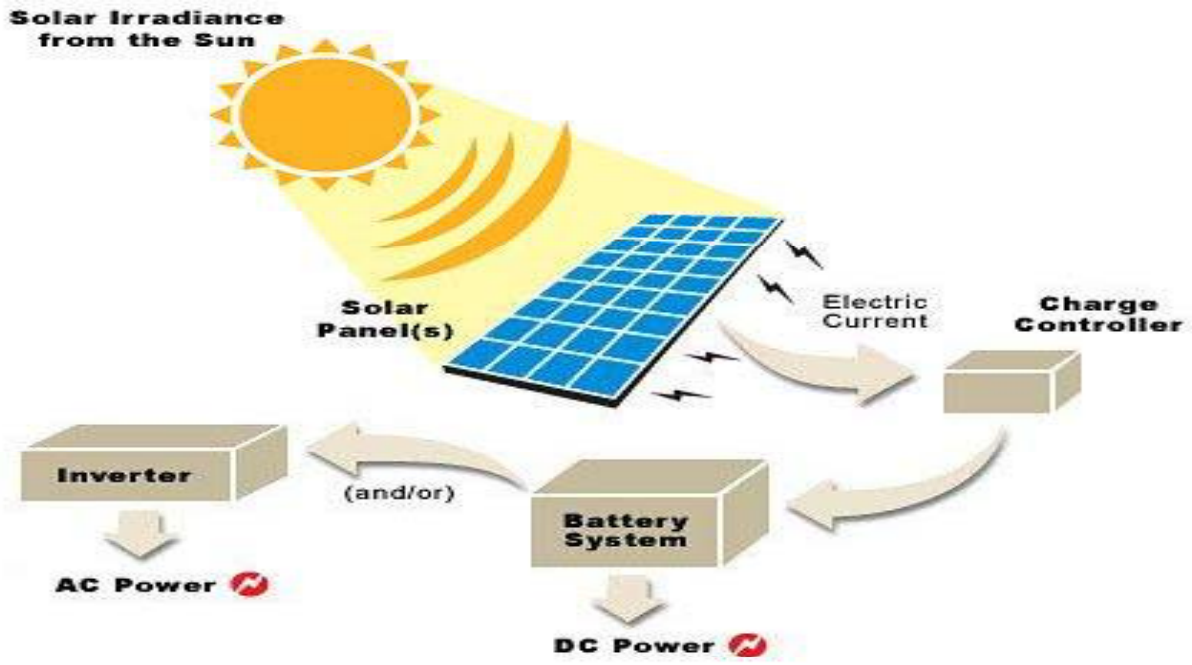
- Grid Tied - Most common
- Utility Grade - Wholesale
- Battery Back-up - Rural/Stand-alone
- Thermal - Hot Water

Grid Tied System

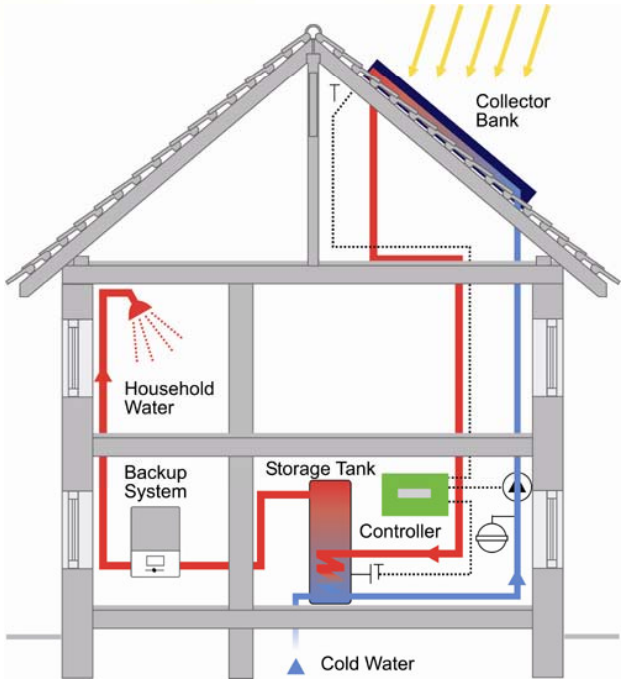


Utility Grade

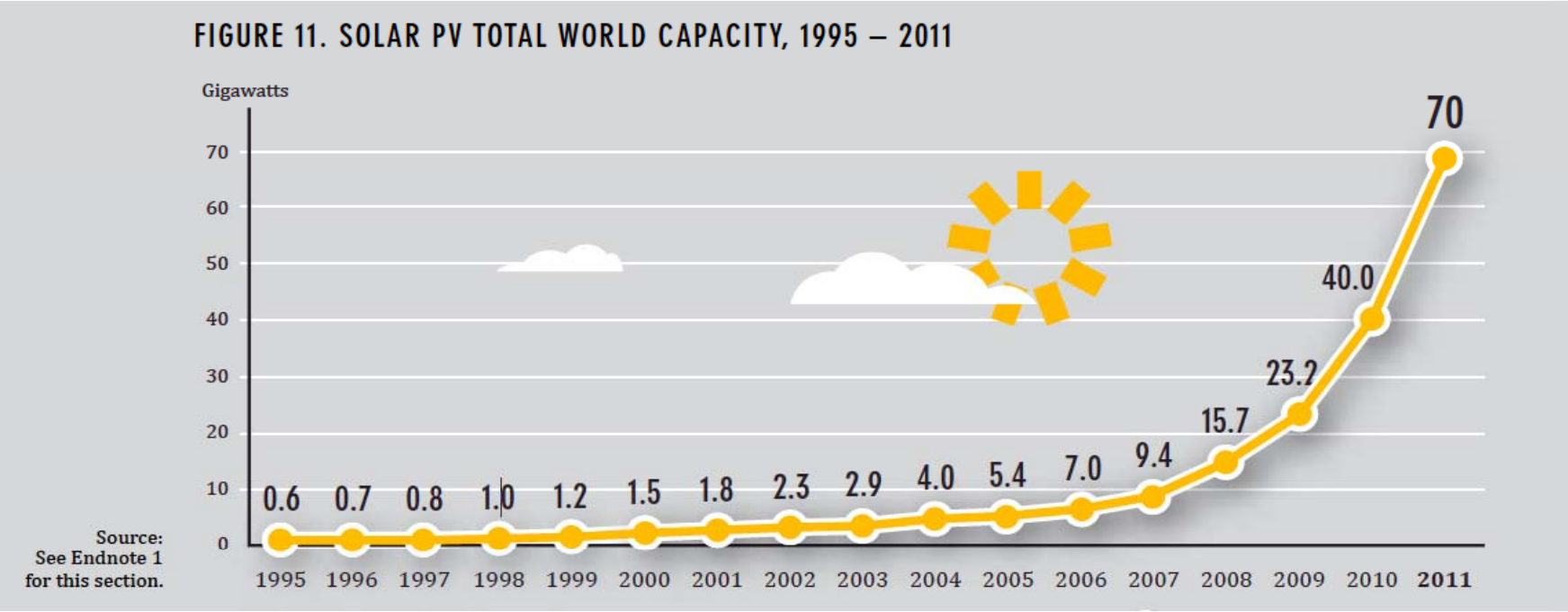
Battery Back-Up



Solar Thermal (Hot Water)



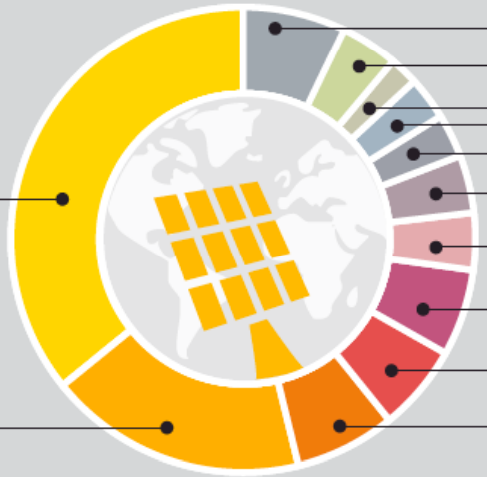
Global Solar Growth



REN2012

Global Leaders in Solar

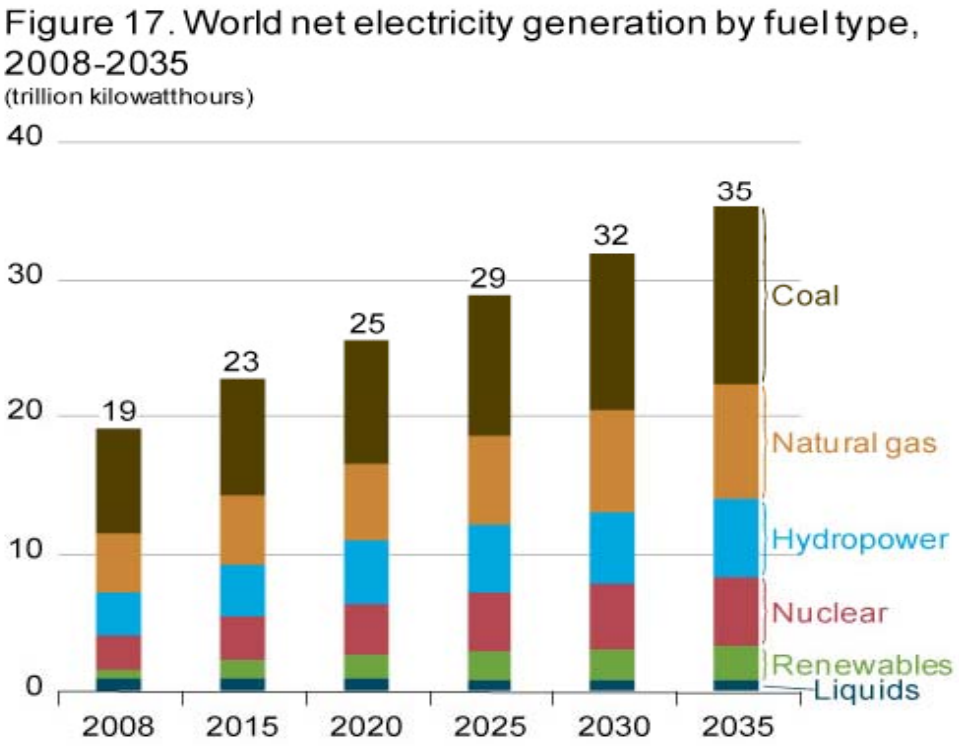
FIGURE 12. SOLAR PV OPERATING CAPACITY, TOP 10 COUNTRIES, 2011



Germany	35.6%
Italy	18.3%
Rest of World	6.9%
Other EU	4.1%
Australia	1.9%
Czech Republic	2.8%
Belgium	2.9%
France	4.1%
China	4.4%
USA	5.7%
Spain	6.5%
Japan	7.1%

Source:
See Endnote 10
for this section.

World Energy Consumption By Fuel Type



Enterdata

US Solar Growth

- PV installations totaled 742 megawatts in Q2 2012
- There is now a **cumulative 5,161 megawatts** of PV capacity spread amongst nearly 248,000 individual systems operating in the U.S. as of the end of Q2
- GTM Research forecasts that 3.2 Gigawatts of PV will be installed in the U.S. just in 2012, up 71 percent over 2011
- The U.S. market, though robust, still represents just 10 percent of the global market and is unlikely to soothe the pain that solar panel makers have suffered due to an oversupply of equipment that has erased profits
- The United States now gets 5.75 percent of its energy from renewables, nearly doubling from four years ago.

GTM Research

US State Solar Growth

Top States by Annual Installed PV - 2012 Forecast			
Rank	Residential	Non-Residential	Utility
1	California	New Jersey	California
2	Arizona	California	Arizona
3	New Jersey	Massachusetts	Nevada
4	Hawaii	Arizona	New Jersey
5	Colorado	Hawaii	Texas
6	Massachusetts	Tennessee	Maryland
7	New York	North Carolina	North Carolina
8	Oregon	Pennsylvania	New Mexico
9	Maryland	New York	Illinois
10	Pennsylvania	Colorado	Massachusetts

SEIA

NJ Solar Update

- As of 7/31/12 - 17,132 Installs equaling 856,262.2 Kw (8.56MW)
- Future Pipline-4,653 systems equaling 7.56 MW – Up to 60% will not be built
- In Q1 2012 We surpassed CA to be come the largest Solar Market in the US
- Christie recently signed the S-1925 bill to Boost Solar in NJ

The Challenge In NJ

- SREC Oversupply - The new Bill is a Temporary Fix
- Many Approved Projects abandoned
- Lack of Commercial Financing
- Lack of attention to the Environmental benefits
- Residential and Small commercial clients not taking advantage of No Money down programs

There are quite a few ways available to reduce the size of our carbon footprint, and they all begin with **awareness**

Solar Power and CO2

- The United States receives more energy in the form of sunlight in less than 40 minutes than from all the fossil fuels we burn every year
- Electricity generated from fossil fuels is the single largest source of carbon dioxide emissions in the U.S. Solar power generates zero carbon emissions
- The average homes' energy consumption creates **10 Tons of CO2/year**
- A typical Residential Solar Installation is equivalent to planting **1 Acre of trees per year for 25 yrs or parking your car for 4 years** with a **Carbon offset of 250 Tons of CO2**
- Sand is a major component of the silicon cells used in a Solar panel. One ton of sand used in making a solar panels can produce as much electricity to offset 500,000 tons of co2
- Solar Panels produce over 25 times the amount of energy used to make them

Solar Mite's Carbon off set

Solar Mite Solutions has installed over 1 MW of Solar

20 Year Effect

- 300,000 Tons of Carbon offset
- 120,000 Trees Planted equivalent
- 36MM Miles not Driven
- Saved $12MM in Electricity

Calculator – Energy Works RE and Solosol

Other ways to reduce our Carbon Footprint?

- Buy Local Food that is in Season
- Use LED Bulbs
- **Conduct a Home Energy Audit**
- Reduce Reuse Recycle
- Travel together
- Use renewable Energy Sources – Solar
- Simply Unplug unused equipment until needed (Ghost Power)

Solar Benefits

- Value: Solar will help you stabilize or reduce your energy costs by replacing the electricity you now buy from your local utility with lower-cost power

- Cleanliness: A solar system produces electricity with no emissions, no greenhouse gases, no pollution and no waste products

- Sustainability: There is an endless supply of FREE sunlight as a fuel source

- Independence: You're generating your own electricity and using it at the location where it's being produced, avoiding the need new infrastructure

- Employment: The growth of solar energy in New Jersey has created thousands of jobs in sales, installation, manufacturing and financing

Legislation around Solar

- Solar Can Not grow without financial incentives
- Federal Tax Credits and Renewable Grants are essential
  - ITC – 30% Individual Tax Credit
  - Accelerated Depreciation
- State Programs are imperative
  - SREC Market Stabilization (Bill – S1925)
  - NET Metering

Financial Drivers for Solar

1. State Rebates
2. Feed-in Tariff
3. Solar Renewable Energy Certificates (SREC)
4. Federal 30% Tax Grant
5. Free Energy – Fix your energy cost
6. Property Value Increase with no Tax assessment increase
7. Equipment Depreciation (5 Yr Accelerated for Commercial)
8. Net – Metering
9. Zero Money Down Solar Programs for Residential and Commercial

NJ Incentives in GREEN

Our Contact Information:

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solarmitesolutions.com

A brief synthesis of the state of climate science and global warming

Thomas L. Delworth
Geophysical Fluid Dynamics Laboratory / NOAA
Princeton University, Princeton, NJ

OBSERVATIONS: Unambiguous evidence that Earth's climate is warming and changing in dramatic ways. These changes are inconsistent with natural variations of climate, but are consistent with predictions of global warming and with our theoretical understanding of how the climate system works.

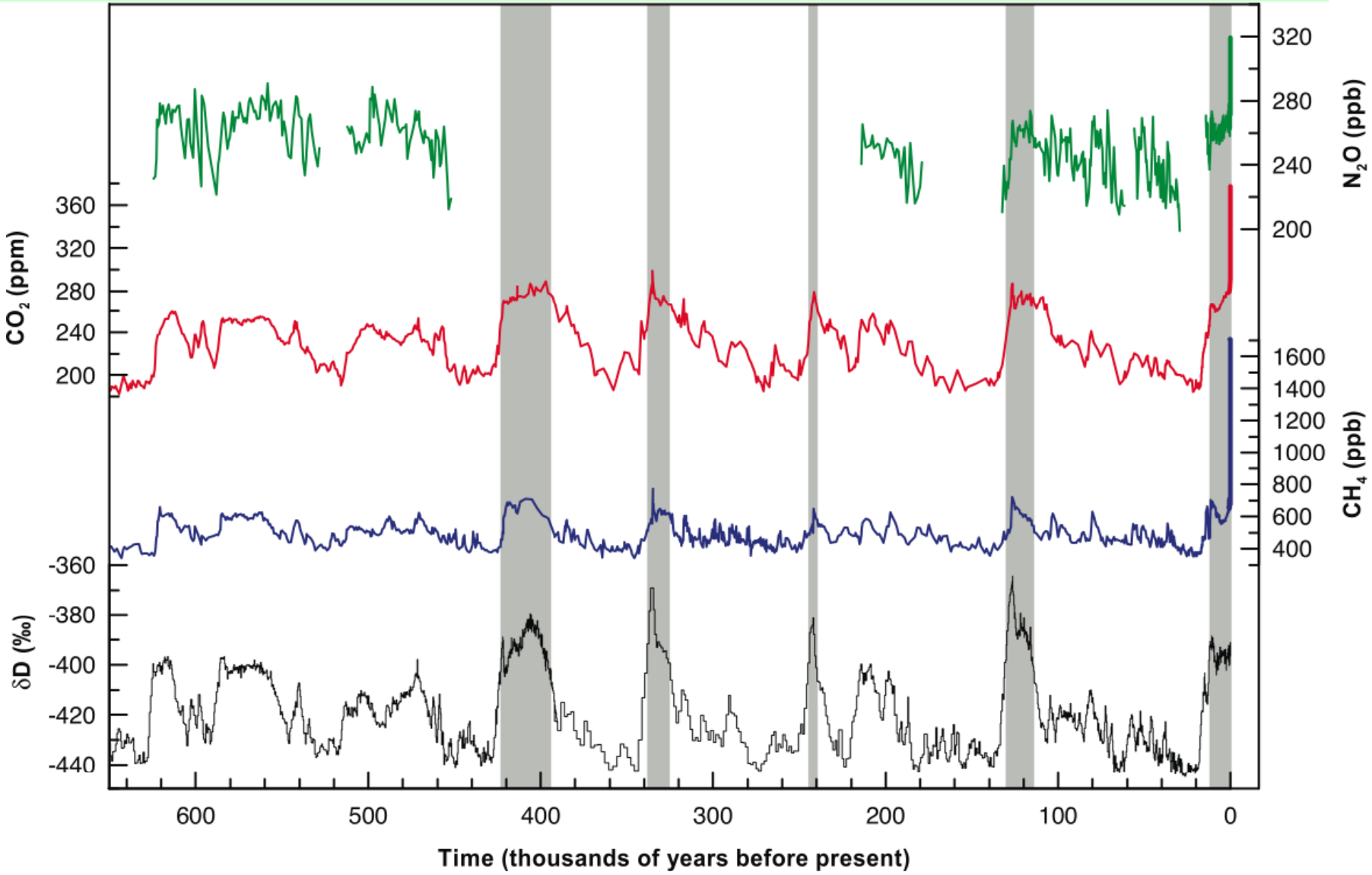
PROJECTING THE FUTURE: We use computer climate models to project future climate using some assumptions about future emissions of greenhouse gases and aerosols. On our current trajectory we expect to see accelerating warming throughout the 21st century.

UNCERTAINTIES:

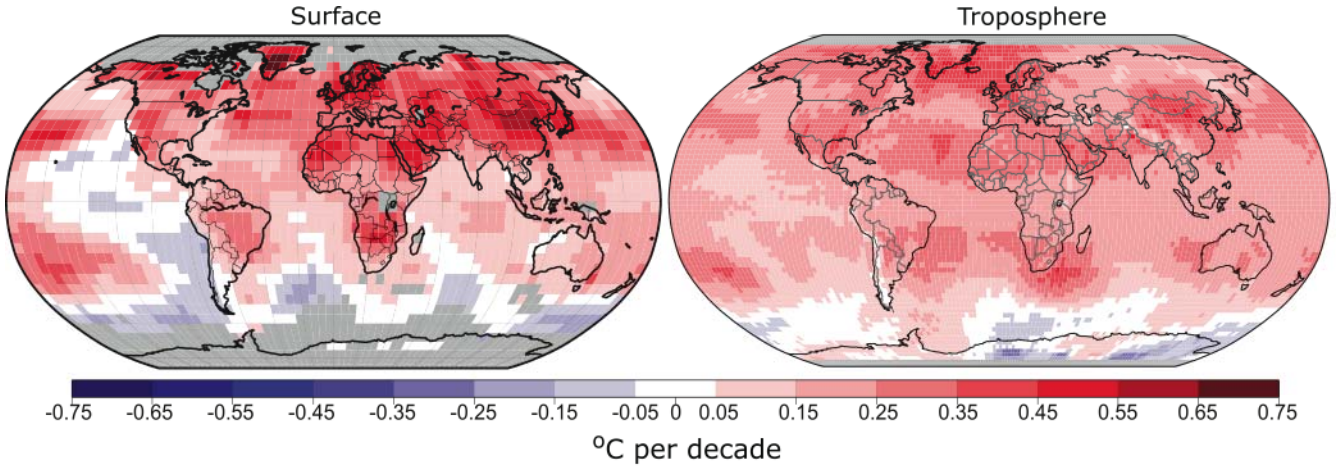
- how good are the models? Some processes (clouds, aerosols) have considerable uncertainty.
- how rapidly will land-based ice sheets (Greenland, Antarctica) respond to climate change?
- additional factors, such as biogeochemical changes and ecosystem changes, complicate the picture

Uncertainty is mainly about ***HOW MUCH*** it will warm (including associated impacts such as regional climate change and extremes), not ***WHETHER*** it will warm!

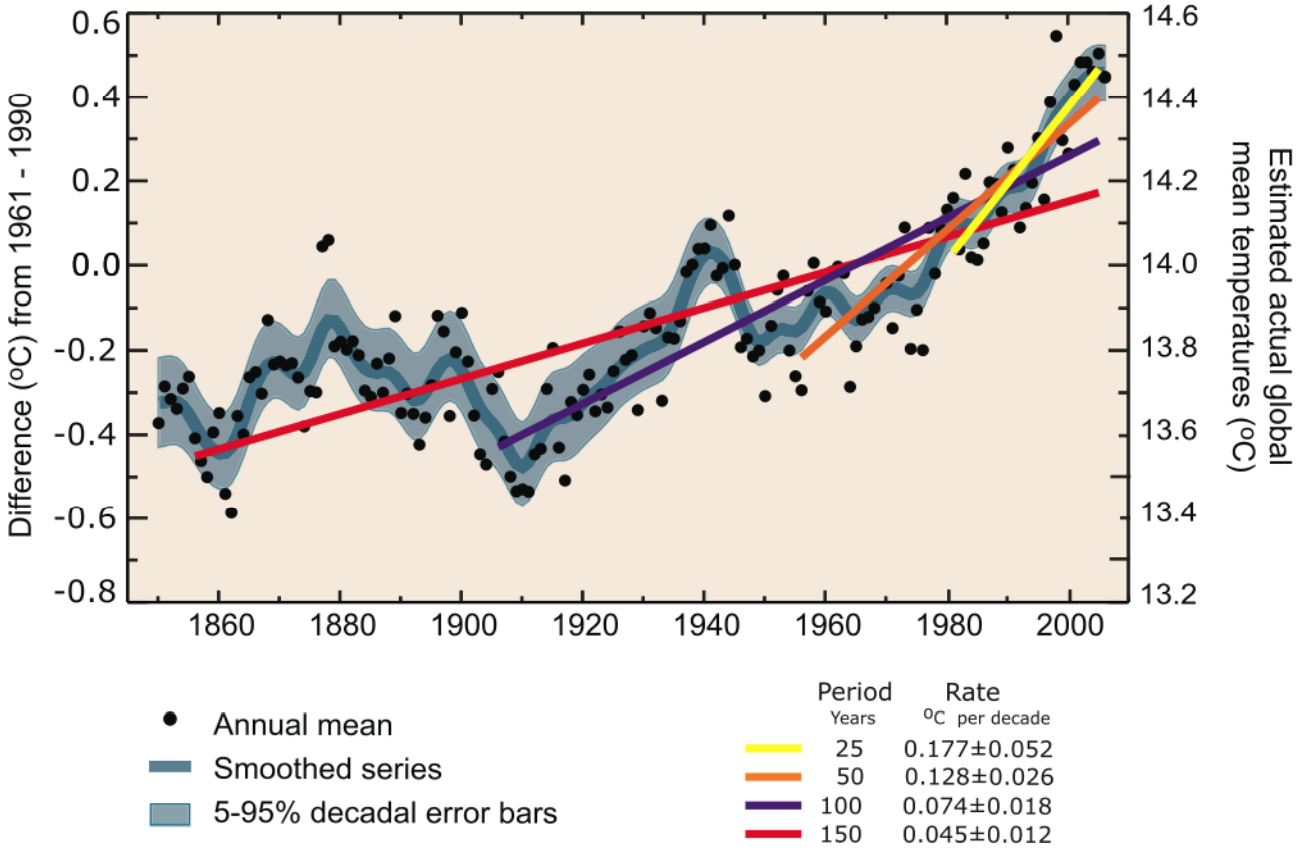
From ancient climates we see that changes in greenhouse gases over the last century are larger and more rapid than any experienced in several hundred thousand years … definitely not a "natural cycle"!



From IPCC AR4 report, 2007



Surface air temperature trends over period 1979-2005



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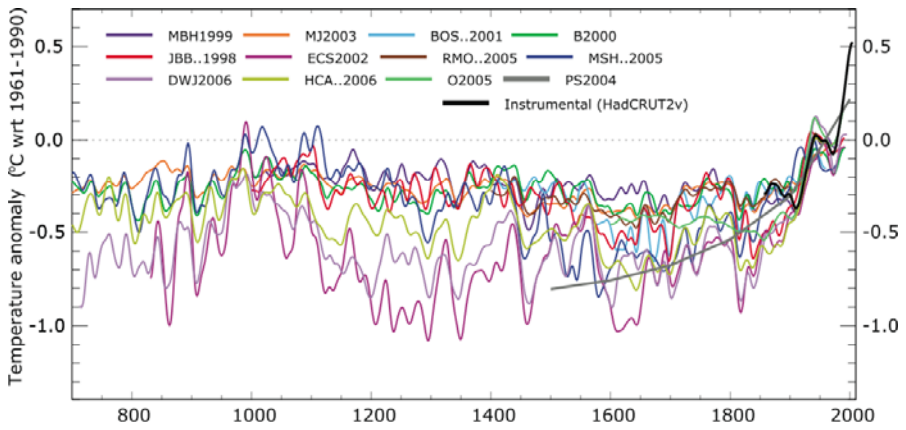
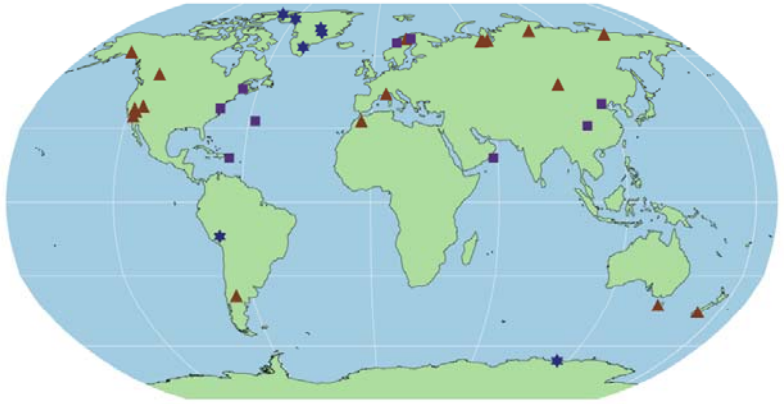
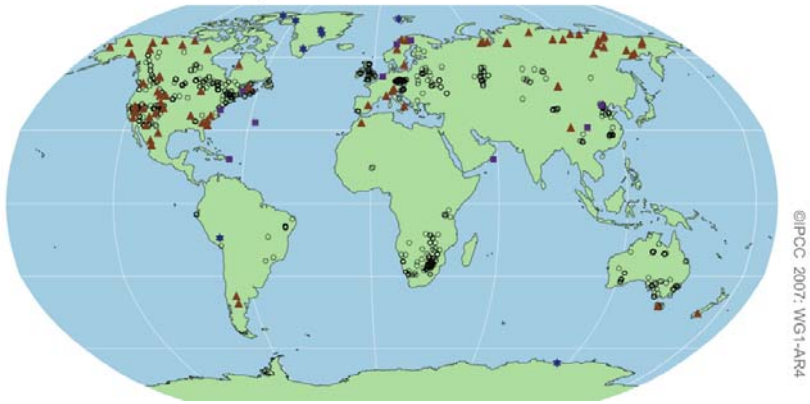


Proxy Record Locations: AD 1000

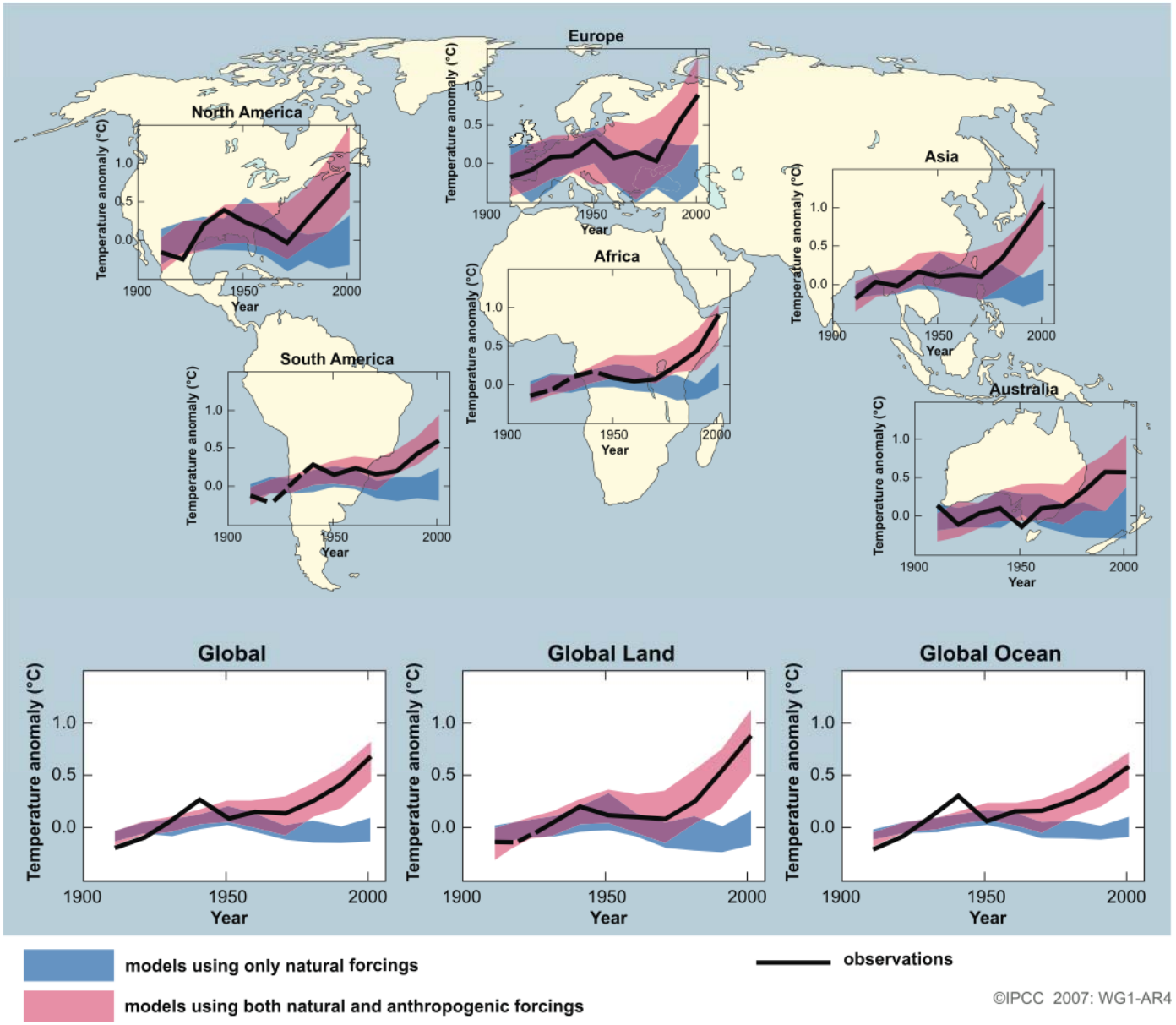


Proxy Record Locations: AD 1500

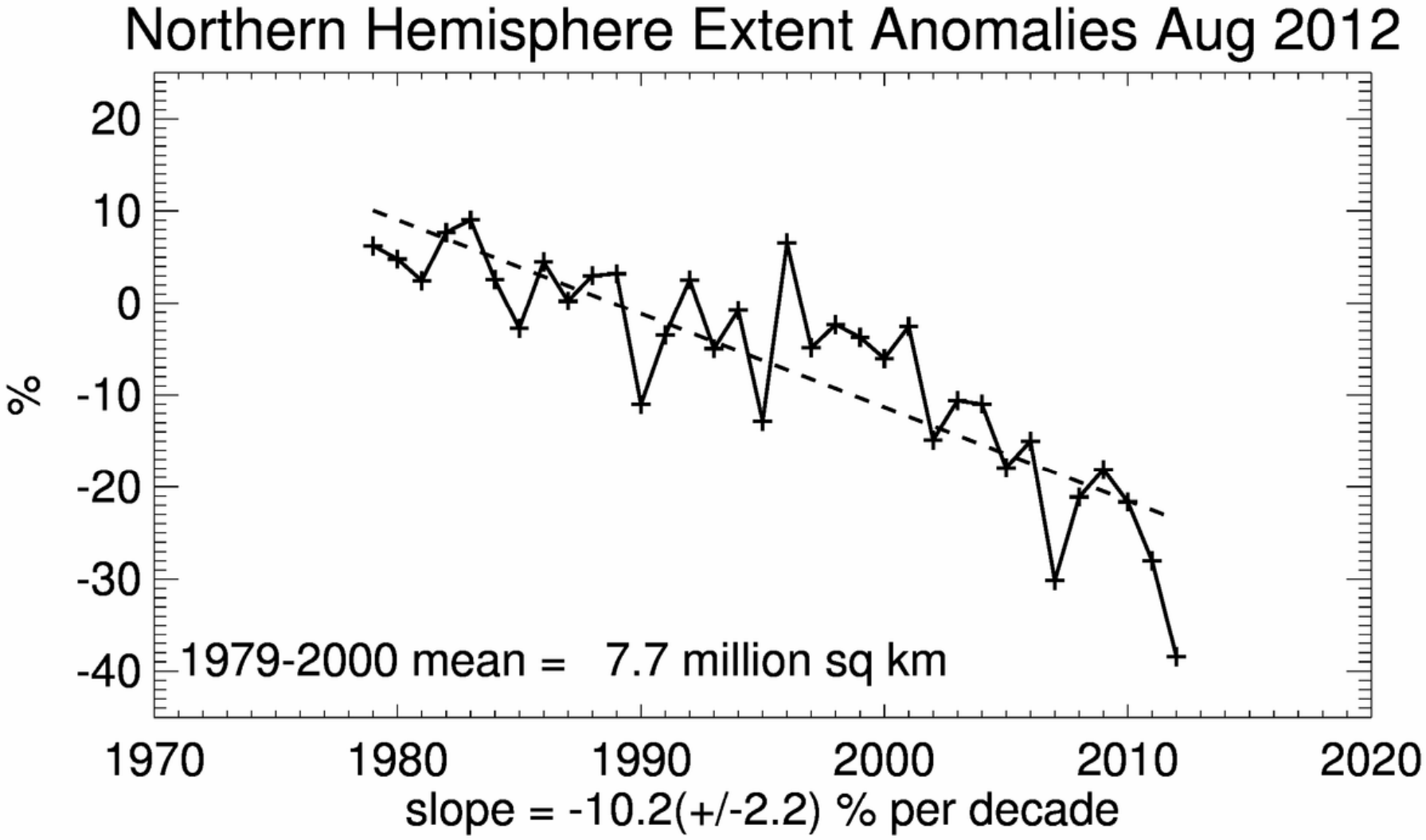


From IPCC AR4 report, 2007

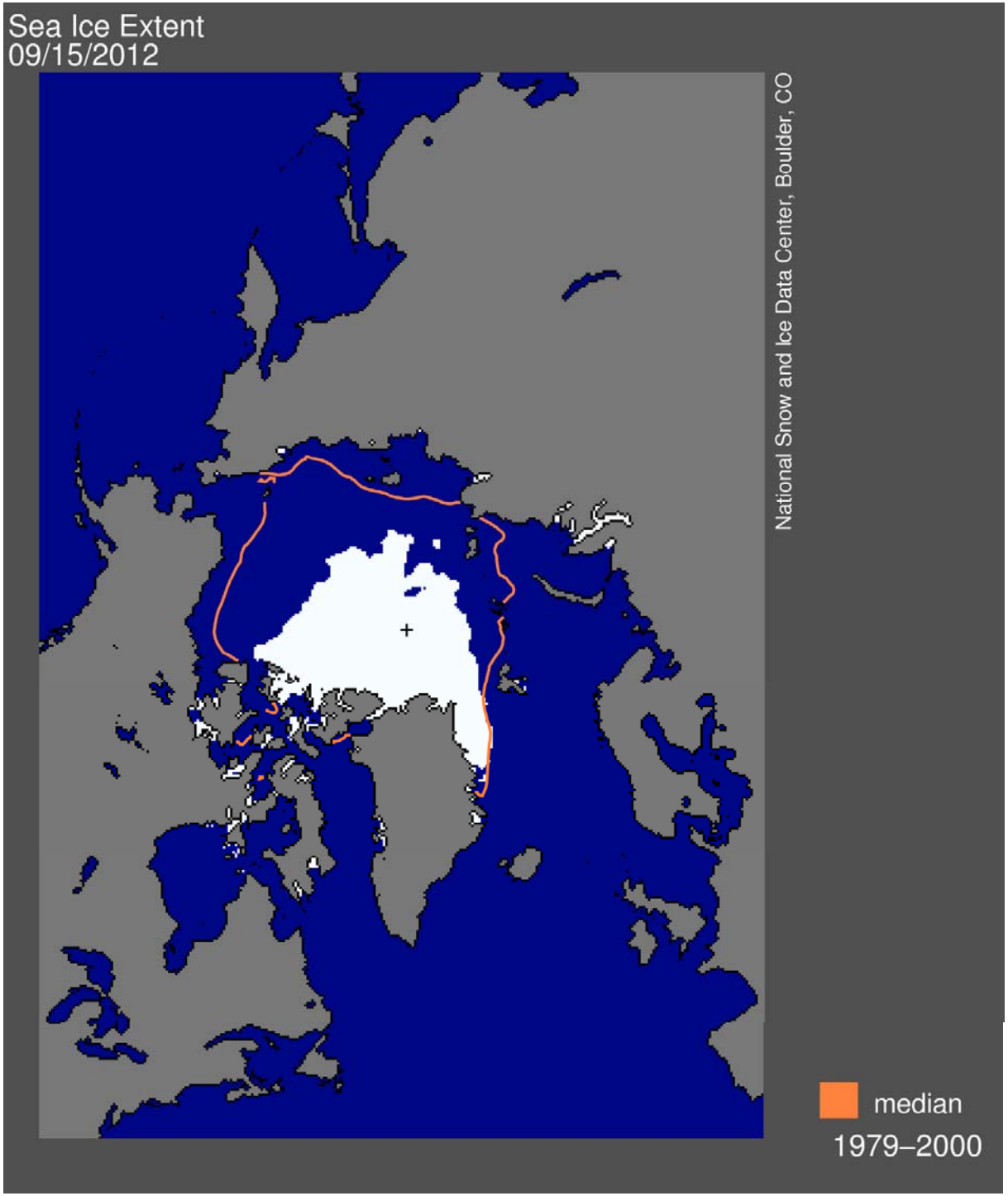
Climate models provide support that observed 20th century warming is due to human activity.



Arctic Sea Ice is declining rapidly!



Courtesy National Snow and Ice Data Center



Courtesy National Snow and Ice Data Center

The changes in some quantities … such as continental scale temperature … are easier to ascribe to global warming than other quantities.

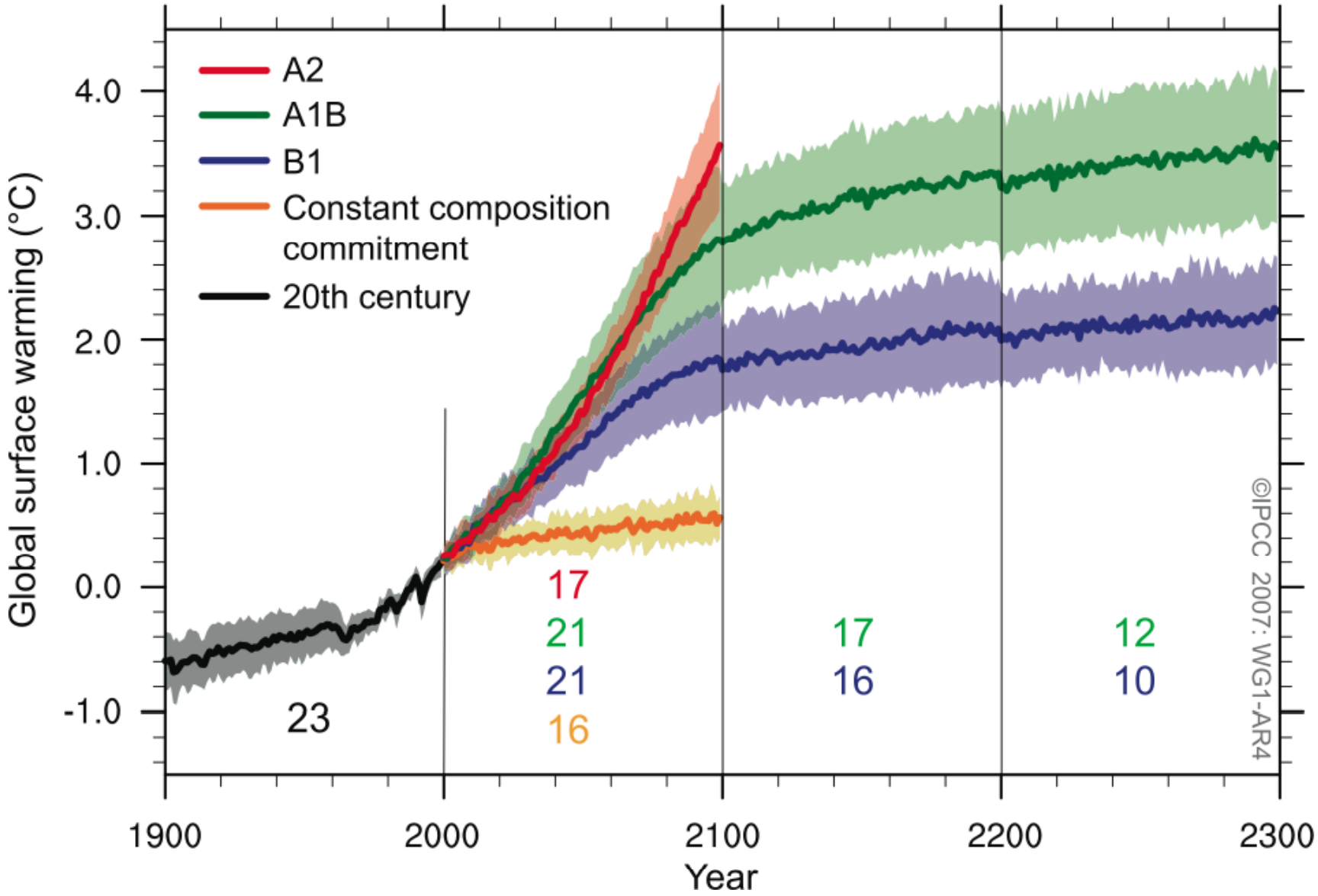
EXAMPLES:

Clear signature of global warming:

- Large-scale surface air temperature
- Upper atmosphere temperature
- Ocean temperature

More ambiguous

- Precipitation
- Extreme events, such as changing hurricane activity
- Small-scale regional climate and short term events (ie, an individual event)



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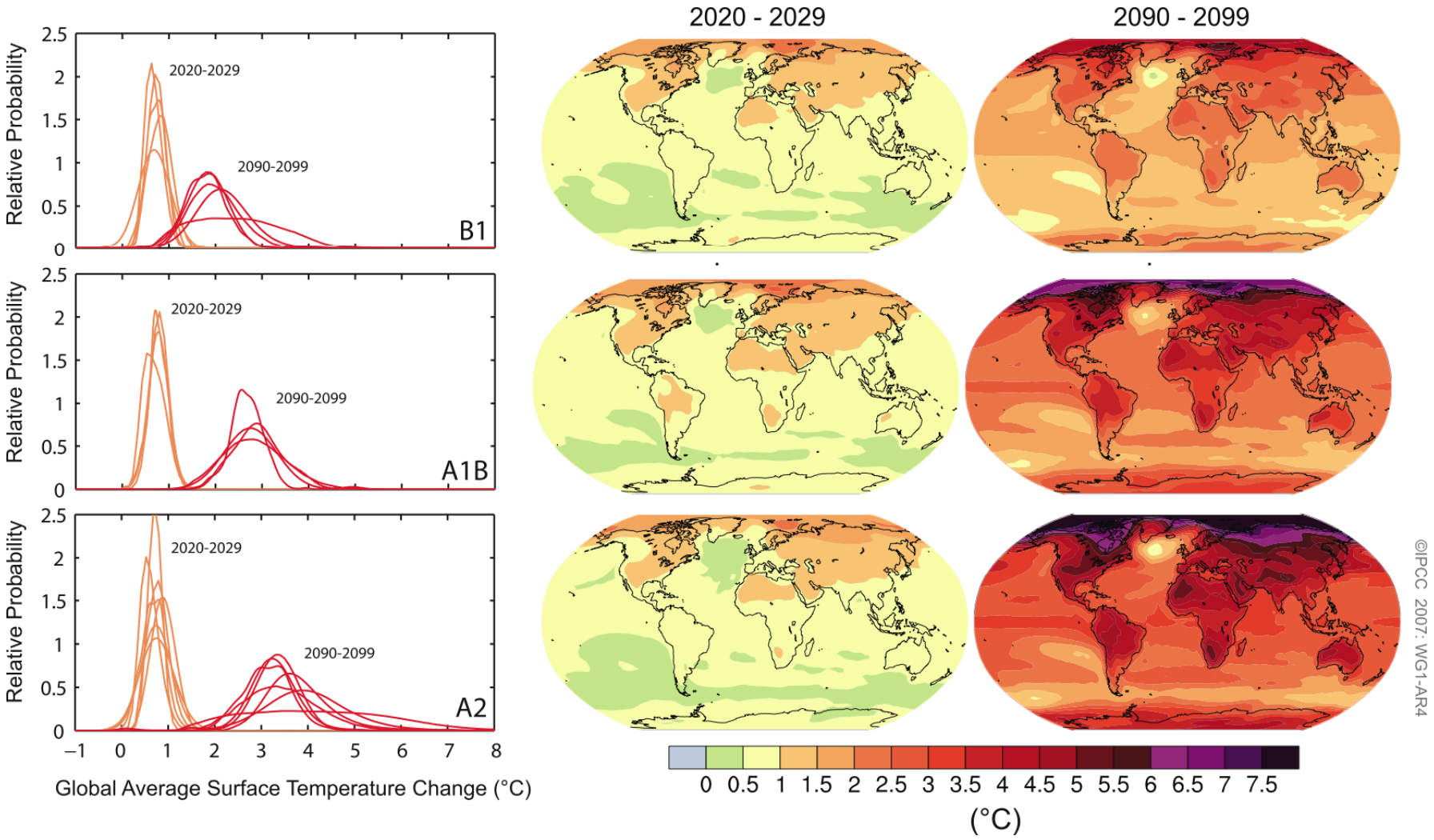
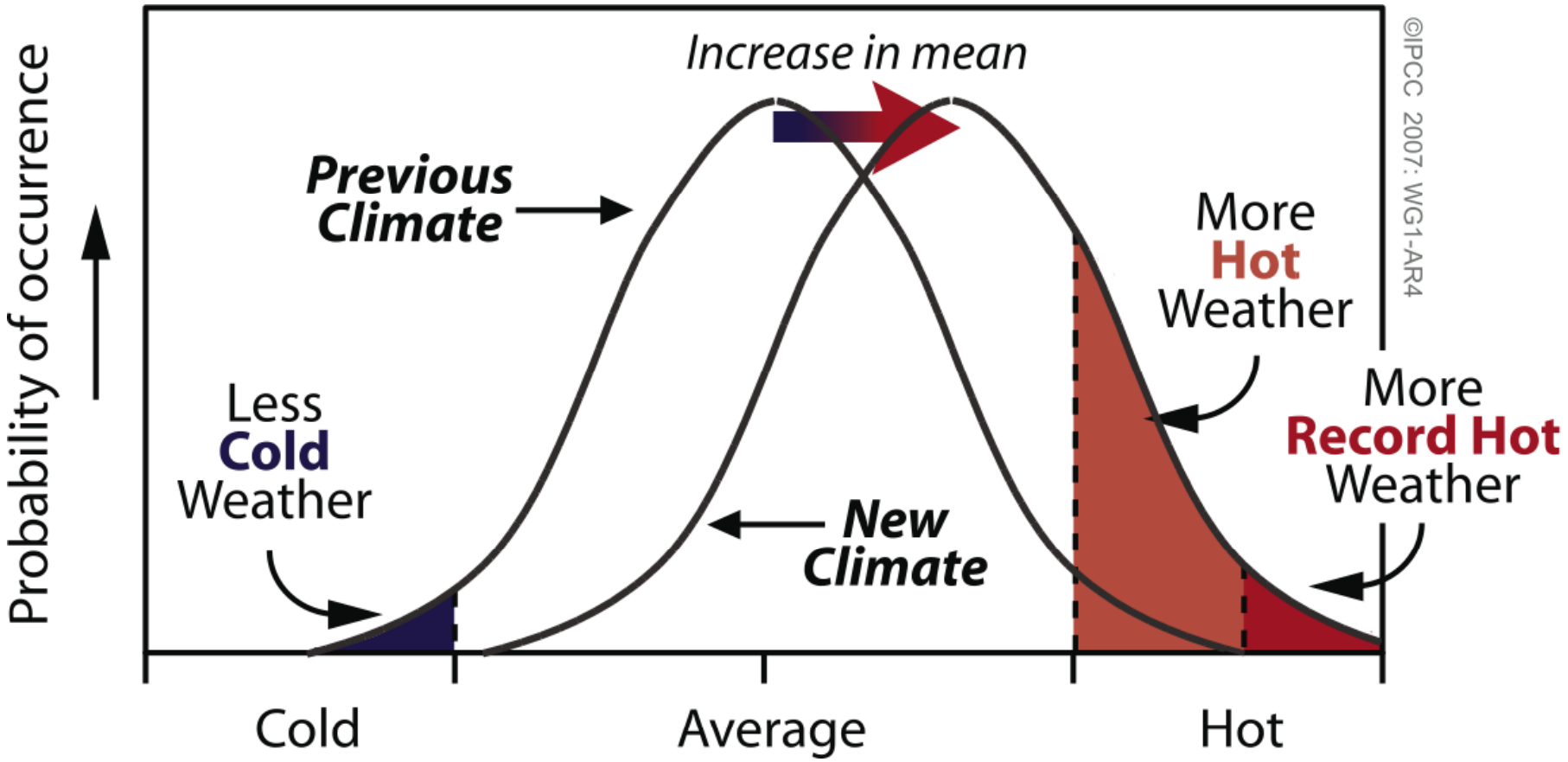


Future emissions matter A LOT in how much the planet will warm!

From IPCC AR4 report, 2007



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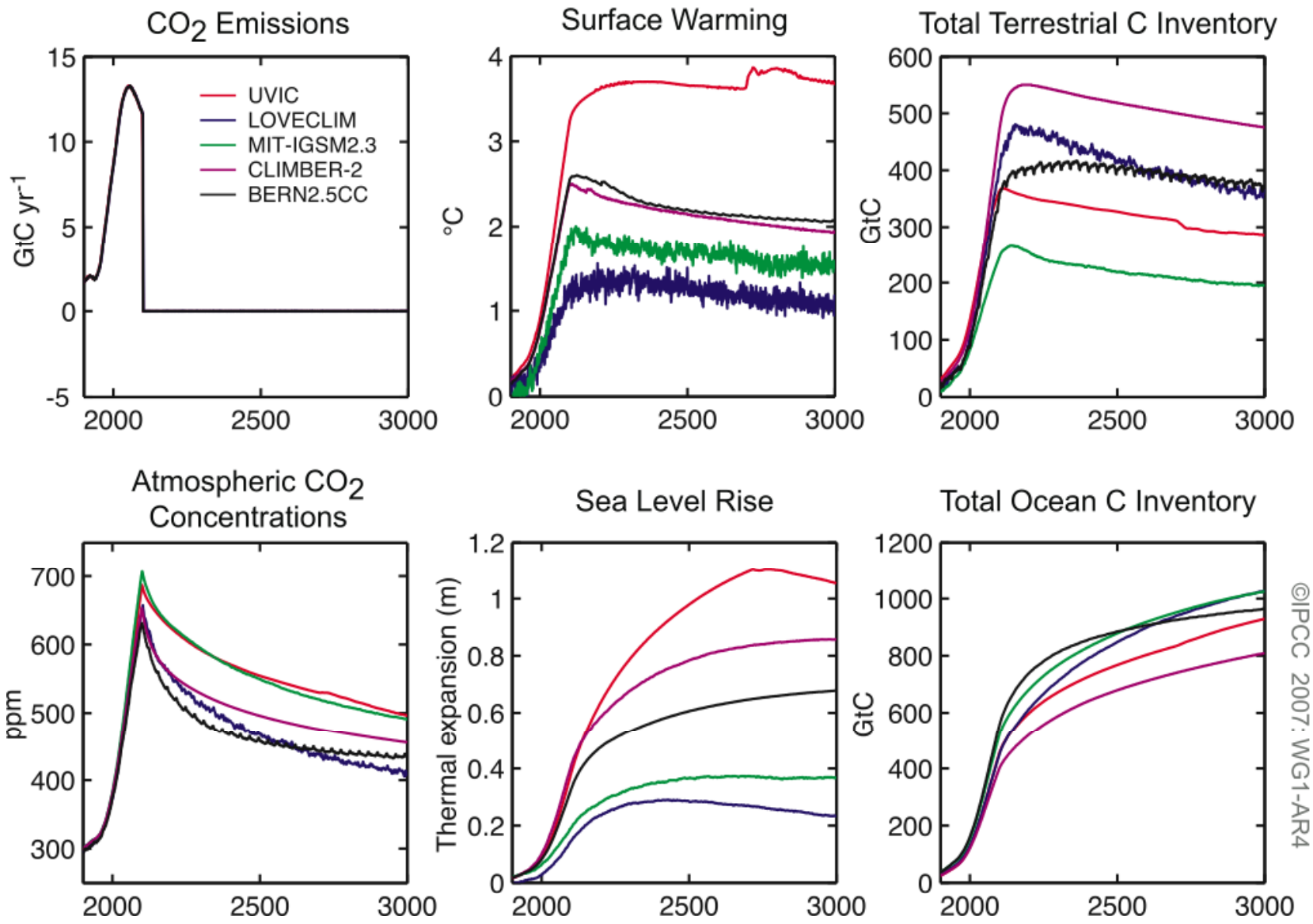

From IPCC AR4 report, 2007

Some topics in leading edge research in climate change science …

1. What will be the changes in climate extremes, such as hurricanes, droughts, heat waves, winter storms, etc

    -- much of the impact of climate change and variations can come from a few extreme events

2. How will clouds respond to climate change … major source of uncertainty in projections of future climate change

3. Response of land-based ice sheets (Greenland and Antarctica) to warming – how fast will they melt?

4. What are the surprises waiting in a greenhouse warmed world?